

September 28, 2017

Mr. Aram Varjabedian
Woodard & Curran
Hull Water Pollution Control Facility
1111 Nantasket Avenue
Hull, Massachusetts 02045

Dear Mr. Varjabedian:

Enclosed, please find three copies of our report presenting the results of a toxicity test completed using an effluent sample collected from the Hull, Massachusetts Water Pollution Control Facility during the August 2017 sampling period. Acute toxicity was evaluated using the inland silverside minnow, *Menidia beryllina*.

Please do not hesitate to call me or Petra Karbe should you have any questions regarding the report.

Sincerely,

EnviroSystems, Incorporated



Kirk Cram
Toxicology Laboratory Manager

Enclosure

WET Test Report Certification
Report Number 29484-17-08
Three (3) copies + email

WHOLE EFFLUENT TOXICITY TEST REPORT CERTIFICATION

Permittee Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on: _____

Authorized Signature

Print or Type Name

Hull Permanent Sewer Commission

Print or Type the Permittee's Name

MA0101231

Type or Print the NPDES Permit No.

WHOLE EFFLUENT TOXICITY TEST REPORT CERTIFICATION (Bioassay Laboratory)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on: September 28, 2017



Kirk Cram
Toxicology Laboratory Manager - EnviroSystems, Inc.

**TOXICOLOGICAL EVALUATION
OF A TREATED MUNICIPAL EFFLUENT
BIOMONITORING SUPPORT FOR A NPDES PERMIT:
August 2017**

Hull Water Pollution Control Facility
Hull, Massachusetts
NPDES Permit Number MA0101231

Prepared For:

Woodard & Curran
Hull Water Pollution Control Facility
1111 Nantasket Avenue
Hull, Massachusetts 02045

Prepared By:

EnviroSystems, Incorporated
One Lafayette Road
Hampton, New Hampshire 03842

August 2017
Reference Number: Hull29484-17-08

STUDY NUMBER 29484

EXECUTIVE SUMMARY

The following summarizes the results of an acute exposure bioassay completed during August 2017 in support of the NPDES biomonitoring requirements of the Hull, Massachusetts Water Pollution Control Facility, operated by Woodard & Curran. The 48 hour acute definitive assay was completed using the inland silverside minnow, *Menidia beryllina*.

M. beryllina, supplied by Aquatic BioSystems, Inc. of Fort Collins, Colorado, were 10 days old at the start of the test. Dilution water was receiving water collected from Massachusetts Bay at a point away from the discharge. Samples were received under chain of custody in good order. All sample receipt, test conditions and control endpoints were within protocol specifications, except where otherwise noted.

The results presented in this report relate only to the samples described on the chain(s) of custody and sample receipt log(s), and are intended to be used only by the submitter. Results from the acute exposure assay and their relationship to permit limits are summarized in the following matrix.

Acute Toxicity Evaluation

Species	Exposure	LC-50	A-NOEC	Permit Limit (LC-50)	Effluent Meets Permit Limit	Assay Meets Protocol Limits
<i>Menidia beryllina</i>	48 Hours	>100%	NC	≥ 100%	Yes	Yes

COMMENTS:

NC = Not Calculated.

**TOXICOLOGICAL EVALUATION
OF A TREATED MUNICIPAL EFFLUENT
BIOMONITORING SUPPORT FOR A NPDES PERMIT:
August 2017**

Hull Water Pollution Control Facility
Hull, Massachusetts
NPDES Permit Number MA0101231

1.0 INTRODUCTION

This report presents the results of an acute toxicity test completed on a composite effluent sample collected from the Hull, Massachusetts Water Pollution Control Facility (Hull WPCF), operated by Woodard & Curran. Testing was based on programs and protocols developed by the US EPA (2002), with exceptions as noted by US EPA Region I (2012), and involved conducting a 48 hour static acute toxicity test with the inland silverside minnow, *Menidia beryllina*. Testing was performed at EnviroSystems, Incorporated (ESI), Hampton, New Hampshire in accordance with the provisions of TNI Standards (2009).

Acute toxicity tests involve preparing a series of concentrations by diluting effluent with control water. Groups of test animals are exposed to each effluent concentration and control for a specified period. In acute tests, mortality data for each concentration are used to calculate the median lethal concentration, or LC-50, defined as the effluent concentration that kills half of the test animals. Samples with high LC-50 values are less likely to cause significant environmental impacts. The no-effect concentration is also determined to provide information about the level of effluent that would have minimal acute effects in the environment. This Acute No Observed Effect Concentration (A-NOEC) is defined as the highest tested effluent concentration that causes no significant mortality.

2.0 MATERIALS AND METHODS

2.1 General Methods

Toxicological and analytical protocols used in this program follow procedures primarily designed to provide standard approaches for the evaluation of toxicological effects of discharges on aquatic organisms (US EPA 2002), and for the analysis of water samples (APHA 2012). See Section 4.0 for a list of references.

2.2 Test Species

When necessary, *M. beryllina* were acclimated to approximate test conditions prior to use in the assay. Test organisms were transferred to test chambers using an inverted glass pipet, minimizing the amount of water added to test solutions. Twenty control fish were weighed during the test to confirm loading rates. The loading rate was below the maximum 0.4 g/L recommended for assays conducted at 25°C. Fish weights and loading calculations are included in the data appendix. Fish were fed <24 hour old *Artemia* nauplii daily until test start.

2.3 Effluent, Receiving Water, and Laboratory Water

Effluent and receiving water collection information is provided in Table 1. Samples were received at 0-6°C as per 40 CFR §136.3 unless otherwise noted, stored at 4±2°C and warmed to 25±1°C prior to preparing test solutions. Effluent used in the *M. beryllina* assay was salinity adjusted to 25±2 ppt using artificial sea salts according to protocol (US EPA 2002). Laboratory water was collected from the Hampton/Seabrook Estuary. This water has been used to culture marine test organisms since 1981.

Total residual chlorine (TRC) was measured by amperometric titration (MDL 0.02 mg/L) in both the effluent and diluent samples. If chlorine was present, the sample was dechlorinated using sodium thiosulfate and a control treatment using laboratory water adjusted with an equal amount of sodium thiosulfate was run concurrently (US EPA 2002). Data for the sodium thiosulfate laboratory control can be found in Appendix A.

2.4 Acute Exposure Bioassay

The 48 hour static acute exposure bioassay was conducted at $25\pm 1^{\circ}\text{C}$ with a photoperiod of 16:8 hours light:dark. Test chambers were 250 mL glass beakers containing 200 mL test solution in each of 4 replicates with 10 organisms/replicate. Replicates were not randomized during testing; rather, organisms were added randomly at test initiation by replicate across test solutions in an alternating fashion (alternating allocation). Test concentrations for the assay were 100% (undiluted), 50%, 25%, 12.5%, and 6.25% effluent. Survival and dissolved oxygen were recorded daily in all replicates. Specific conductivity, salinity, temperature, and pH were measured daily in one replicate of each test treatment.

2.5 Data Analysis

When applicable, statistical analysis of acute exposure data was completed using CETIS™ v1.9.3.0, Comprehensive Environmental Toxicity Information System, software. The program computes acute exposure endpoints based on US EPA decision tree guidelines specified in individual test methods. If survival in the highest test concentration is >50%, the LC-50 is obtained by direct observation of the raw data. As needed, the A-NOEC is determined as the highest test concentration that caused no significant mortality.

2.6 Quality Control

As part of the laboratory quality control program, standard reference toxicant assays are completed on a regular basis for each test species. These results provide relative health and response data while allowing for comparison with historic data sets. See Table 2 for details.

3.0 RESULTS AND DISCUSSION

Results of the acute exposure bioassay completed using the inland silverside minnow are summarized in Table 3. Effluent and dilution water characteristics are presented in Table 4. US EPA Region I toxicity test summary sheets can be found after the tables. Support data, including copies of laboratory bench sheets, are included in Appendix A.

Minimum test acceptability criteria require $\geq 90\%$ survival in the control concentrations. Achievement of these results indicates that healthy test organisms were used and that the dilution water had no significant adverse impact on the outcome of the assay. See the Executive Summary and Table 3 for test acceptability.

4.0 LITERATURE CITED

40 CFR §136.3. *Code of Federal Regulations* (CFR), Protection of the Environment (Title 40), Guidelines Establishing Test Procedures for the Analysis of Pollutants (Part 136), Identification of Test Procedures (sub-part 3), Table II-Required Containers, Preservation Techniques, and Holding Times.

APHA. 2012. *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition. Washington D.C.

The NELAC Institute (TNI). 2009. *Environmental Laboratory Sector, Volume 1: Management and Technical Requirements for Laboratories Performing Environmental Analysis (TNI Standard)*. EL-V1-2009.

US EPA. 2002. *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms*. Fifth Edition. EPA-821-R-02-012.

US EPA Region I. 2012. *Marine Acute Toxicity Test Procedure and Protocol*. US EPA Region I Office, Boston, Massachusetts. July 2012.

**TABLE 1. Summary of Sample Collection Information.
Hull WPCF Effluent Biomonitoring Program. August 2017.**

Sample Description	Type	Collection		Receipt		Arrival Temp °C
		Date	Time	Date	Time	
Effluent	Comp	08/29-30/17	0800-0800	08/30/17	1030	0
Receiving Water	Grab	08/30/17	0800	08/30/17	1030	0

**TABLE 2. Summary of Reference Toxicant Data.
Hull WPCF Effluent Biomonitoring Program. August 2017.**

Date	Endpoint		Value	Historic Mean/ Central Tendency	Acceptable Range	Reference Toxicant
<i>M. beryllina</i>						
08/31/17	Survival	48Hr LC-50	7.3	6.8	5.4 - 8.1	SDS (mg/L)

Means and Acceptable Ranges based on the most recent 20 reference toxicant assays.

**TABLE 3. Summary of Acute Evaluation Results.
Hull WPCF Effluent Biomonitoring Program. August 2017.**

Species	Exposure	Lab	Percent Survival					
			RW	6.25%	12.5%	25%	50%	100%
<i>M. beryllina</i>	48 hours	100%	100%	100%	100%	100%	100%	100%

LC-50 and A-NOEC Results						
Species	Exposure	Spearman-Kärber	Probit	Direct Observation	A-NOEC	
<i>M. beryllina</i>	48 Hours	NC	NC	>100%	NC	

COMMENTS:

RW = Receiving Water; used as the diluent.

NC = Not Calculated.

**TABLE 4. WET Support Chemistry Data.
Hull WPCF Effluent Biomonitoring Program. August 2017.**

PARAMETER	UNIT	EFFLUENT	RECEIVING WATER
Specific Conductivity - As Received	µmhos/cm	17430	47060
pH - As Received	SU	7.09	7.73
Salinity - As Received	ppt	9	30
Total Residual Chlorine	mg/L	<0.02	<0.02
Total Solids	mg/L	10000	35000
Total Suspended Solids	mg/L	12	4.1
Ammonia as N	mg/L	0.29	<0.1
Total Organic Carbon	mg/L	10.2	2.5
Aluminum, total	mg/L	0.021	0.061
Cadmium, total	mg/L	<0.0005	<0.0005
Calcium, total	mg/L	141	367
Chromium, total	mg/L	<0.002	<0.002
Copper, total	mg/L	0.0084	0.003
Lead, total	mg/L	<0.0005	<0.0005
Magnesium, total	mg/L	332	1090
Nickel, total	mg/L	<0.002	<0.002
Zinc, total	mg/L	0.039	0.0023

COMMENTS:

Additional water quality and support chemistry data are provided in Appendix A.

TOXICITY TEST SUMMARY SHEET

FACILITY NAME: Hull WPCF TEST START DATE: 08/31/17
 NPDES PERMIT NO.: MA0101231 TEST END DATE: 09/02/17

TEST TYPE	TEST SPECIES	SAMPLE TYPE	SAMPLE METHOD
<input checked="" type="checkbox"/> Acute	<input type="checkbox"/> <i>Pimephales promelas</i>	<input type="checkbox"/> Prechlorinated	<input type="checkbox"/> Grab
<input type="checkbox"/> Chronic	<input type="checkbox"/> <i>Ceriodaphnia dubia</i>	<input type="checkbox"/> Dechlorinated	<input checked="" type="checkbox"/> Composite
<input type="checkbox"/> Modified Chronic (Reporting Acute Values)	<input type="checkbox"/> <i>Daphnia pulex</i>	<input type="checkbox"/> Chlorine Spiked in Lab	<input type="checkbox"/> Flow-thru
<input type="checkbox"/> 24 Hour Screen	<input type="checkbox"/> <i>Americamysis bahia</i>	<input type="checkbox"/> Chlorinated on Site	<input type="checkbox"/> Other
	<input type="checkbox"/> <i>Cyprinodon variegatus</i>	<input type="checkbox"/> Unchlorinated	
	<input checked="" type="checkbox"/> <i>Menidia beryllina</i>	<input checked="" type="checkbox"/> No Detectable Chlorine Upon Receipt	
	<input type="checkbox"/> <i>Arbacia punctulata</i>	<input type="checkbox"/> Dechlorinated at lab	

DILUTION WATER:

☒ Receiving water collected at a point upstream or away from the discharge, free from toxicity or other sources of contamination; Receiving Water Name: Massachusetts Bay

☐ Alternate surface water of known quality and hardness, to generally reflect the characteristics of the receiving water; Receiving Water Name: _____

☐ Synthetic water prepared using either Millipore Milli-Q or equivalent deionized water and reagent grade chemicals; or deionized water combined with mineral water.

☐ Artificial sea salts mixed with deionized water

☐ Deionized water and hypersaline brine

☐ Other

EFFLUENT SAMPLING DATES: 08/29-30/17

EFFLUENT CONCENTRATIONS TESTED (%): 6.25; 12.5; 25; 50; 100

Permit Limit Concentration: ≥100 %

Was the effluent salinity adjusted? Yes If yes, to what level? 25 ppt

REFERENCE TOXICANT TEST DATE: 08/31/17 LC-50: 7.3 mg/L Sodium Dodecyl Sulfate

PERMIT LIMITS AND TEST RESULTS

Test Acceptability Criteria

Mean Control Survival: 100 %

LIMITS

LC-50: ≥100 %

A-NOEC: - %

C-NOEC: - %

IC- - %

RESULTS

LC-50 >100 %

Upper Limit: - %

Lower Limit: - %

Method: Direct Observation

A-NOEC: - %

C-NOEC: - %

C-LOEC: - %

IC- - %

APPENDIX A
DATA SHEETS
STATISTICAL SUPPORT

Contents	Number of Pages
Methods Used in NPDES Permit Biomonitoring Testing	1
Massachusetts DEP Accreditation Certification and Certified Parameter List	3
<i>M. beryllina</i> Acute Bioassay Bench Sheet	2
Organism Wet Weights	1
Organism Culture Data	1
Preparation of Dilutions and Record of Meters Used	1
Analytical Chemistry Support Data Summary Report	1
Sample Receipt Record	1
Chain of Custody	1
Assay Review Checklist	1
 Total Appendix Pages	 13

METHODS USED IN NPDES PERMIT BIOMONITORING TESTING

Parameter	Method
Acute Exposure Bioassays:	
<i>Ceriodaphnia dubia</i>	EPA-821-R-02-012 2002.0
<i>Daphnia pulex</i>	EPA-821-R-02-012 2021.0
<i>Pimephales promelas</i>	EPA-821-R-02-012 2000.0
<i>Americamysis bahia</i>	EPA-821-R-02-012 2007.0
<i>Menidia beryllina</i>	EPA-821-R-02-012 2006.0
<i>Cyprinodon variegatus</i>	EPA-821-R-02-012 2004.0
Chronic Exposure Bioassays:	
<i>Ceriodaphnia dubia</i>	EPA-821-R-02-013 1002.0
<i>Pimephales promelas</i>	EPA-821-R-02-013 1000.0
<i>Cyprinodon variegatus</i>	EPA-821-R-02-014 1004.0
<i>Menidia beryllina</i>	EPA-821-R-02-014 1006.0
<i>Arbacia punctulata</i>	EPA-821-R-02-014 1008.0
<i>Champia parvula</i>	EPA-821-R-02-014 1009.0
Trace Metals:	
Trace Metals	EPA 200.8/SW 6020, EPA 245.7
Hardness	EPA SW846 3rd Ed. 6010
Wet Chemistries:	
Alkalinity	EPA 310.2
Chlorine, Residual	Standard Methods 22 nd Edition - Method 4500-Cl D
Total Organic Carbon	Standard Methods 22 nd Edition - Method 5310 C
Specific Conductance	Standard Methods 22 nd Edition - Method 2510 B
Nitrogen - Ammonia	Standard Methods 22 nd Edition - Method 4500-NH ₃ G
pH	Standard Methods 22 nd Edition - Method 4500-H+ B
Solids, Total (TS)	Standard Methods 22 nd Edition - Method 2540 B
Solids, Total Dissolved (TDS)	Standard Methods 22 nd Edition - Method 2540 C
Solids, Total Suspended (TSS)	Standard Methods 22 nd Edition - Method 2540 D
Dissolved Oxygen	Standard Methods 22 nd Edition - Method 4500-O G

Please visit our web site at www.envirosystems.com for a copy of our accreditations and state certifications.

The Commonwealth of Massachusetts



Department of Environmental Protection

Division of Environmental Analysis

Senator William X. Wall Experiment Station

certifies

M- NH906

ENVIROSYSTEMS INC
1 LAFAYETTE RD
HAMPTON, NH 03842-0000

Laboratory Director: RUSSELL D. FOSTER

for the analysis of NON POTABLE WATER (CHEMISTRY)

pursuant to 310 CMR 42.00

This certificate supersedes all previous Massachusetts certificates issued to this laboratory. The laboratory is regulated by and shall be responsible for being in compliance with Massachusetts regulations at 310 CMR 42.00.

This certificate is valid only when accompanied by the latest dated Certified Parameter List as issued by the Massachusetts D.E.P. Contact the Division of Environmental Analysis to verify the current certification status of the laboratory.

Certification is no guarantee of the validity of the data. This certification is subject to unannounced laboratory inspections.

A handwritten signature in dark ink, appearing to read "Oscar C. Garabito".

Director, Division of Environmental Analysis

Issued: 01 JUL 2017

Expires: 30 JUN 2018

Certified Parameter List as of: 01 JUL 2017

NON POTABLE WATER (CHEMISTRY)

17 MAY 2017

Analytes

Methods

EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 245.7
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
EPA 200.8
SM 4500-H-B
SM 2510B
EPA 310.2
SM 4500-CL-C
EPA 300.0
EPA 300.0
SM 4500-NH3-B, G
SM 4500-NO3-F
SM 4500-NH3-B, G
SM 4500-P-E
SM 4500-P-B,E
SM 5210B
SM 5310C
SM 4500-CN-C,E
SM 2540D
EPA 1664
EPA 624
EPA 624
EPA 608
EPA 608
EPA 608
EPA 608
EPA 608
EPA 608

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certified Parameter List as of: 01 JUL 2017

M-NH906 ENVIROSYSTEMS INC
HAMPTON NH

NON POTABLE WATER (CHEMISTRY)

Effective Date 17 MAY 2017

Expiration Date 30 JUN 2018

Analytes

Methods

HEPTACHLOR

EPA 608

HEPTACHLOR EPOXIDE

EPA 608

SVOC-ACID EXTRACTABLES

EPA 625

SVOC-BASE/NEUTRAL EXTRACTABLES

EPA 625

POLYCHLORINATED BIPHENYLS (WATER)

EPA 608

ACUTE BIOASSAY DATA SUMMARY

STUDY: 298445 (23) MW 5/12		Brine Shrimp: A-4729		"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES															
CLIENT: Woodward & Curran		TEST ORGANISM: <i>M. beryllina</i>		T. Metals		TOC		AMM		TS/TSS		pH		S/C		SALINITY (ppt)		TRC	
SAMPLE: Hull WWTF Effluent		ORGANISM SUPPLIER / BATCH / AGE:		EFF		002		003		004		7.09		17430		9.2		20.02	
DILUENT: Receiving Water		See Organism Culture Sheet		DIL				009		010		7.73		47060		30.3		20.02	

SALINITY ADJUSTMENT RECORD: 4,000 ML EFFLUENT + 71.28 G SEA SALTS (A-4682) = 100% ACTUAL PERCENTAGE																	
; 8,000 ML DILUENT + 1800 ML DI H ₂ O = 81.60%																	

CONC	REP	SURVIVAL			DO (mg/L)			pH (SU)			TEMP (°C)			S/C (µmhos/cm)			SALINITY (ppt)		
		0	24	48	0	24	48	0	24	48	0	24	48	0	24	48			
LAB SALT	A	10	10	10	7.3	6.7	7.2	7.86	7.70	7.73	23	23	24	38780	39330	39110	25	25	25
	B	10	10	10	7.3	6.6	7.2												
	C	10	10	10	7.3	6.6	7.1												
	D	10	10	10	7.3	6.4	7.1												
RW	A	10	10	10	7.4	5.6	7.0	7.78	7.66	7.70	23	23	23	38660	39500	39640	25	25	25
	B	10	10	10	7.4	5.4	7.0												
	C	10	10	10	7.4	5.5	7.1												
	D	10	10	10	7.4	5.7	7.1												
6.25%	A	10	10	10	7.5	5.6	6.8	7.77	7.68	7.72	23	23	23	39070	39630	39860	25	25	25
	B	10	10	10	7.5	5.6	6.8												
	C	10	10	10	7.5	5.5	6.7												
	D	10	10	10	7.5	5.5	6.7												
12.5%	A	10	10	10	7.4	5.6	6.6	7.76	7.74	7.79	23	23	23	39120	39520	40140	25	25	25
	B	10	10	10	7.4	5.6	6.7												
	C	10	10	10	7.4	5.7	6.4												
	D	10	10	10	7.4	5.7	6.4												

DATE	8/21/17	9/11/17	9/21/17	8/31/17	9/11/17	9/21/17
TIME	1150	1140	0950	1105	1100	0910
INITIALS	MW	MW	MW	MW	MW	MW

ACUTE BIOASSAY DATA SUMMARY

STUDY: 29845-484		Brine Shrimp: A- 4729	
CLIENT: Woodard & Curran (23) MW 9/2/17		TEST ORGANISM: <i>M. beryllina</i>	
SAMPLE: Hull WWTF Effluent		ORGANISM SUPPLIER / BATCH / AGE:	
DILUENT: Receiving Water		See Organism Culture Sheet	

CONC	REP	SURVIVAL		DO (mg/L)		pH (SU)		TEMP (°C)		S/C (µmhos/cm)		SALINITY (ppt)							
		0	24	48	0	24	48	0	24	48	0	24	48						
25%	A	10	10	10	7.5	5.6	6.7	7.75	7.72	7.79	23	23	23	39180	39430	40180	25	25	25
	B	10	10	10	7.5	5.5	6.7												
	C	10	10	10	7.5	5.5	6.6												
	D	10	10	10	7.5	5.4	6.6												
50%	A	10	10	10	7.4	5.6	6.5	7.69	7.75	7.84	23	23	23	39300	39170	40200	25	25	26
	B	10	10	10	7.4	5.6	6.5												
	C	10	10	10	7.4	5.5	6.5												
	D	10	10	10	7.4	5.4	6.4												
100%	A	10	10	10	8.5	5.4	6.0	7.64	7.87	7.98	23	23	23	39800	39730	40900	25	25	26
	B	10	10	10	8.5	5.4	6.0												
	C	10	10	10	8.5	5.3	6.1												
	D	10	10	10	8.5	5.1	6.1												
DATE	8/31/17		9/1/17	9/2/17	8/31/17	9/1/17	9/2/17												
TIME	1150		1140	0950	1105	1100	0910												
INITIALS	MW		MW	MW	MW	MW	MW												

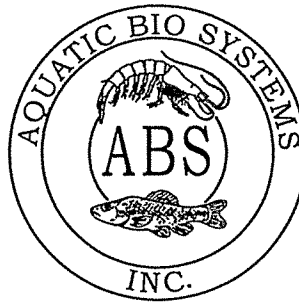
STUDY: 29484
CLIENT: Hull
PROJECT:
ASSAY: MB48AD
SPECIES: *M. beryllina*
TASK: Wet Weight Data - Balance Output File
BALANCE: Ohaus Discovery Balance Model DV215CD
Serial #: 1124024313

Date / Intials: 08/31/17 MW

Rep	
1	0.00268
2	0.00249
3	0.00325
4	0.00291
5	0.00158
6	0.00259
7	0.00239
8	0.00232
9	0.00283
10	0.00176
11	0.00458
12	0.00331
13	0.00321
14	0.00166
15	0.00103
16	0.00251
17	0.00202
18	0.00127
19	0.00096
20	0.00135

Mean Weight (g):	0.00234
Test Volume (L):	0.2
Loading Rate(g/L):	0.11675

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524



Toll Free: 800/331-5916
Tel: 970/484-5091 Fax: 970/484-2514

ORGANISM HISTORY

DATE: 8/29/2017

SPECIES: Menidia beryllina

AGE: 8 day

LIFE STAGE: Juvenile

HATCH DATE: 8/21/2017

BEGAN FEEDING: Immediately

FOOD: Rotifers, Artemia sp.

Water Chemistry Record:

	Current	Range
TEMPERATURE:	<u>24 °C</u>	<u>23-26 °C</u>
SALINITY/CONDUCTIVITY:	<u>25 ppt</u>	<u>23-26 ppt</u>
TOTAL HARDNESS (as CaCO ₃):	<u>--</u>	<u>--</u>
TOTAL ALKALINITY (as CaCO ₃):	<u>210 mg/l</u>	<u>165-210 mg/l</u>
pH:	<u>8.18</u>	<u>7.87-8.24</u>

Comments:



Facility Supervisor

RECORD OF METERS USED

STUDY: 29845-3 MW 484		CLIENT: Woodard & Curran - Hull, MA WWTF	
Exposure (Hours)			
	0	24	48
Water Quality Station #	1	1	1
Initials / Date	MW 8/31/17	MW 9/1/17	MW 9/2/17

Water Quality Station #1	Water Quality Station #2	COMMENTS
DO meter # 24	DO meter #	8/31/17 Added a lab and
DO probe # 95	DO probe #	100% control.
pH meter # 1091	pH meter #	
pH probe # 147	pH probe #	
S/C meter # YS120D	S/C meter #	
S/C probe #	S/C probe #	
Salinity meter #	Salinity meter #	

PREPARATION OF DILUTIONS

Diluent: Receiving Water (RW)	Day: 0	E _s : 24.7°C
	Sample: E _s , D ₀	D ₀ : 25.1°C
Concentration %	Vol. Eff. (mls)	Final Vol. (mls)
Lab Salt	0	1,000
RW	0	
6.25%	62.5	
12.5%	125	
25%	250	
50%	500	
100%	1,000	↓
INITIALS:	MW	
TIME:	1050	
DATE:	8/31/17	

Report No: 29484 SDG:
Project: Hull

Sample ID: Effluent Start
Matrix: Water
Sampled: 08/30/17 0800

Parameter		Result	Quant Limit	Units	Date Prepared	Date of Analysis	INIT/Method/Reference
Total solids	29484-006	10000	100	mg/L	09/06/17 1435	09/20/17 1045	KB /SM 2540B
Total suspended solids	29484-005	12	1	mg/L	08/30/17 1350	09/05/17 1000	KB /SM 2540D
Total organic carbon	29484-003	10.2	2	mg/L	09/15/17	09/15/17	BS /SM 5310 C
Ammonia-N	29484-004	0.29	0.1	mg/L as N	09/01/17 1020	09/01/17 1110	BS /SM 4500-NH3 G
Aluminum, total	29484-002	0.021	0.02	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8
Cadmium, total	29484-002	ND	0.0005	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8
Calcium, total	29484-002	141	0.1	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8
Chromium, total	29484-002	ND	0.002	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8
Copper, total	29484-002	0.0084	0.0005	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8
Lead, total	29484-002	ND	0.0005	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8
Magnesium, total	29484-002	332	0.1	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8
Nickel, total	29484-002	ND	0.002	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8
Zinc, total	29484-002	0.039	0.002	mg/L	09/07/17 1030	09/07/17 2308	JLH/EPA 200.8

Sample ID: Receiving Water Start
Matrix: Water
Sampled: 08/30/17 0800

Parameter		Result	Quant Limit	Units	Date Prepared	Date of Analysis	INIT/Method/Reference
Total solids	29484-012	35000	100	mg/L	09/06/17 1435	09/20/17 1045	KB /SM 2540B
Total suspended solids	29484-011	4.1	1	mg/L	08/30/17 1350	09/05/17 1000	KB /SM 2540D
Total organic carbon	29484-009	2.5	2	mg/L	09/28/17	09/28/17	BS /SM 5310 C
Ammonia-N	29484-010	ND	0.1	mg/L as N	09/01/17 1020	09/01/17 1110	BS /SM 4500-NH3 G
Aluminum, total	29484-008	0.061	0.02	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8
Cadmium, total	29484-008	ND	0.0005	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8
Calcium, total	29484-008	367	0.1	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8
Chromium, total	29484-008	ND	0.002	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8
Copper, total	29484-008	0.003	0.0005	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8
Lead, total	29484-008	ND	0.0005	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8
Magnesium, total	29484-008	1090	0.1	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8
Nickel, total	29484-008	ND	0.002	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8
Zinc, total	29484-008	0.0023	0.002	mg/L	09/07/17 1030	09/07/17 2314	JLH/EPA 200.8

Notes:

ND = Not Detected

ESI

SAMPLE RECEIPT AND CONDITION DOCUMENTATION

Page 1 of 1

STUDY NO: 29484
 SDG No: Hull
 Project: Hull
 Delivered via: ESI
 Date and Time Received: 08/30/17 1030 Date and Time Logged into Lab: 08/30/17 1435
 Received By: RS Logged into Lab by: MS MS
 Air bill / Way bill: No Air bill included in folder if received? NA
 Cooler on ice/packs: Yes Custody Seals present? NA
 Cooler Blank Temp (C) at arrival: 0.2 Custody Seals intact? NA
 Number of COC Pages: 1
 COC Serial Number(s): A1015164
 COC Complete: Yes Does the info on the COC match the samples? Yes
 Sampled Date: Yes Were samples received within holding time? Yes
 Field ID complete: Yes Were all samples properly labeled? Yes
 Sampled Time: Yes Were proper sample containers used? Yes
 Analysis request: Yes Were samples received intact? (none broken or leaking) Yes
 COC Signed and dated: Yes Were sample volumes sufficient for requested analysis? Yes
 Were all samples received? Yes Were VOC vials free of headspace? NA
 Client notification/authorization: Not required pH Test strip ID number: A-4732

Field ID	Lab ID	Mx	Analysis Requested	Bottle	Req'd Pres'n	Verified Pres'n
Effluent Start	29845-001	W	MB48AD StartSample	1x3750 P	4 C	
Effluent Start	29845-002	W	Total Metals Cd,Cr,Ni,Pb,Cu,Zn,Al,Ca,Mg;	250 P	HNO3	Yes
Effluent Start	29845-003	W	TOC	1x40 G	H2SO4	Yes
Effluent Start	29845-004	W	NH3;	125 P	H2SO4	Yes
Effluent Start	29845-005	W	TSS	1000 P	4 C	
Effluent Start	29845-012	W	TS	250 P	4 C	
Receiving Water Start	29845-007	W	MB48AD StartDiluent	2x3750 P	4 C	
Receiving Water Start	29845-008	W	Total Metals Cd,Cr,Ni,Pb,Cu,Zn,Al,Ca,Mg;	250 P	HNO3	Yes
Receiving Water Start	29845-009	W	TOC	1x40 G	H2SO4	Yes
Receiving Water Start	29845-010	W	NH3;	125 P	H2SO4	Yes
Receiving Water Start	29845-011	W	TSS	1000 P	4 C	
Receiving Water Start	29845-012	W	TS	250 P	4 C	

Notes and qualifications:

See COC



EnviroSystems, Inc.
1 Lafayette Road
Hampton, NH 03842

Voice: 603-926-3345
FAX: 603-926-3521

ESI Job No: 29385484
OAS
04/27

CHAIN OF CUSTODY DOCUMENTATION

Client:	Hull	Contact:	Aram Variabedian	Project Name:	Hull WWTF
Report to:	Aram Variabedian	Address:	1111 Nantasket Avenue	Project Number:	P0036
Invoice to:	Aram Variabedian	Address:	Hull, MA 02045	Project Manager:	Aram Variabedian
Voice:	781-925-0906	Fax:	781-925-3056	email:	
Protocol:	NPDES			P.O. No.:	Quote No: 41181

Lab Number (assigned by lab)	Your Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Grab or composite (G/C)	No	Container Size (mL)	Type (P/G/T)	Field Preservation	Matrix S-Solid W-Water	Filter N=Not needed F=Done in field L=Lab to do	Analyses Requested Special Instructions:
001	Effluent Start	8/24/17	8A-8A	SS	C	1	3750	P	4 C	Water	N	MB48AD Start Sample
002	Effluent Start	8/24/17	8A-8A	SS	C	1	250	P	HNO3	Water	N	Total Metals Cd, Cr, Ni, Pb, Cu, Zn, Al, Ca, Mg;
003	Effluent Start	8/24/17	8A-8A	SS	C	1	40	G	H2SO4	Water	N	TOC
004	Effluent Start	8/24/17	8A-8A	SS	C	1	125	P	H2SO4	Water	N	NH3;
005	Effluent Start	8/24/17	8A-8A	SS	C	1	1000	P	4 C	Water	N	TSS
006	Effluent Start	8/24/17	8A-8A	SS	C	1	250	P	4 C	Water	N	TS
007	Receiving Water Start	8/30/17	8A-8A	SS	G	2	3750	P	4 C	Water	N	MB48AD Start Diluent
008	Receiving Water Start	8/30/17	8A-8A	SS	G	1	250	P	HNO3	Water	N	Total Metals Cd, Cr, Ni, Pb, Cu, Zn, Al, Ca, Mg;
009	Receiving Water Start	8/30/17	8A-8A	SS	G	1	40	G	H2SO4	Water	N	TOC
010	Receiving Water Start	8/30/17	8A-8A	SS	G	1	125	P	H2SO4	Water	N	NH3;
011	Receiving Water Start	8/30/17	8A-8A	SS	G	1	1000	P	4 C	Water	N	TSS
012	Receiving Water Start	8/30/17	8A-8A	SS	G	1	250	P	4 C	Water	N	TS

Relinquished By:	Eric Sutton	Date:	8/30/17	Time:	10:30 AM	Received By:	R. S. [Signature]	Date:	8/30/17	Time:	1030
Relinquished By:		Date:		Time:		Received at Lab By:		Date:		Time:	

Comments: 0.2°C please call if any issues as it is late in morning. R.V.

ERR

COC Number: A1015164

Sample Delivery Group No: July 2017 Page of

Assay Review Checklist

DATE IN: 08/30/17

STUDY#: 29845484 (23) MW 9/12/17

DATE DUE: 10/10/17

CLIENT: Woodward + Curran

PROJECT: Hull

ASSAY: MB48AD

Project Paperwork Check for Completeness			
	Date	Initials	Comments
Day 0	8/31/17	MW	
Day 1	9/1/17	MW	
Day 2	9/2/17	MW	
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Day 8			

Analyst Data Review	Date	Initials	Comments
Chains of Custody Complete	09/05/17	KB	
Sample Receipt Complete	↓	↓	
Organism Culture Sheet(s)	↓	↓	
Bench Sheets Complete (dates, times, initials, etc...)	↓	↓	
Water Quality Data Complete	↓	↓	
TRC Values & Bottle Numbers	↓	↓	
Daphnid Calculations Complete	N/A	N/A	
Weights Reported	09/05/17	KB	
Assay Acceptability Review	↓	↓	

Technical Report Review	Date	Initials	Comments
Statistical Analysis Complete	N/A		
Statistical Analysis Reviewed	↓		
Data Acceptability Review	9/27/17	LB	
Supporting Chemistry Report	9/28/17	LB	
Draft Report	9/27/17	LB	
QA Audit/Review Complete			
Final Report Reviewed	9/28/17	AK	
Final Report Printed - PDF	9/28/17	LB	
Executive Summary / Chems Sent			
Report E-mailed / Faxed	9/28/17	LB	
Report Logged Out / Invoice Sent	↓	↓	
Report Scanned to Archive	↓	↓	